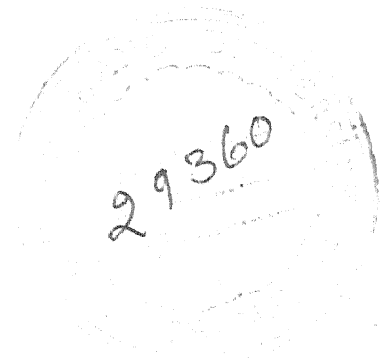


**CLINICAL STUDY OF ENCEPHALITIS
IN
BUNDEL KHAND REGION**

**THESIS
For
DOCTOR OF MEDICINE
(GENERAL MEDICINE)**



**BUNDELKHAND UNIVERSITY
JHANSI [U. P.]**

C E R T I F I C A T E

This is to certify that the work entitled
"A CLINICAL STUDY OF ENCEPHALITIS IN BUNDELKHAND REGION"
which is being submitted as a thesis for M.D.(Medicine)
examination, 1992 of Bundelkhand University, has been
carried out by Dr. Ram Kumar Nag in the department of
Medicine, M.L.B. Medical College, Jhansi.

He has put in the necessary stay in the
department of Medicine as per university regulations.

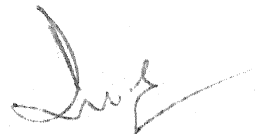
Dated :

R. C. Arora
14/3/92
(R. C. Arora)
M.D., D.Sc.,
Professor and Head,
Department of Medicine,
M.L.B. Medical College,
JHANSI.

C E R T I F I C A T E

This is to certify that the work entitled
"A CLINICAL STUDY OF ENCEPHALITIS IN BUNDELKHAND REGION",
which is being submitted as a thesis for M.D.(Medicine)
examination, 1992 of Bundelkhand University, has been
carried out by Dr. Ram Kumar Nag under my direct
supervision and guidance. The techniques embodied in
this work were under taken by the candidate himself.
The results and observations recorded were checked and
verified by me from time to time.

Dated: 14.3.92



(D. N. Mishra)
MD, MNAMS, FCCP,
Professor of Medicine,
M.L.B. Medical College,
JHANSI.

(GUIDE)

ACKNOWLEDGEMENTS

The most pleasant duty in a work like this is to remember and record the contributions of all those without whom the preparation of this thesis would have never been possible.

This has indeed been a rare privilege to have had an opportunity to work under the inspiring guidance of our learned and experienced teacher Dr. D. N. Mishra, MD, FCCP, MNAMS, Professor of Medicine, M.L.B. Medical College, Jhansi. It is to him, I owe a lot in terms of knowledge and experience and the techniques of clinical practice. To him I owe an inexpressible gratitude.

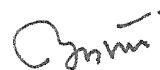
I wish to express my gratitude for the continuous help and inspiration to my teacher Prof. R. C. Arora, M.D., D.Sc., Head of the department of Medicine, M.L.B. Medical College, Jhansi. This work could have never been completed, if he had not shown the path through the unsurmountable obstacles.

I have no words to express my regards to my esteemed teacher Dr. G.D. Shukla, M.D., Ph.D., MNAMS, Assistant Professor (Psychiatry), M.L.B. Medical College, Jhansi, for his keen interest, constant encouragement, timely suggestions, criticism and unlimited help. With my meagre vocabulary, I just can say that it is my

profound privilege and pleasure to get the opportunity of expressing my grateful thanks and atmost gratitude to him.

I am equally grateful to Dr. P.K. Jain, M.D., M.N.A.M.S., Dr. Navnit Agarwal, M.D., Dr. Praveen Kumar, M.D., Dip. Card., D.M.(Card.), and Dr. T.V.S. Arya, M.D., Assistant Professors, Department of Medicine, M.L.B. Medical College, Jhansi for their constant encouragement to me.

Dated: 14.3.92



(Ram Kumar Nag)

C O N T E N T S

<u>CHAPTER</u>	<u>Page No.</u>
INTRODUCTION	1 - 2
REVIEW OF LITERATURE	3 - 23
AIMS OF THE STUDY	24
MATERIAL AND METHODS	25 - 29
OBSERVATIONS	30 - 57
DISCUSSION	58 - 63
SUMMARY AND CONCLUSION	64 - 66
BIBLIOGRAPHY	67 - 73

INTRODUCTION

The term encephalitis was first introduced by Globus et al (1932) to the 'Inflammation of Brain Tissue.'

It occurs in sporadic or epidemic forms and may have limited distribution or be wide spread, both in urban and rural areas. It has been observed that mortality rate of encephalitis is very high because of lack of adequate and specialized facilities for diagnosis and treatment. Diagnosis is often based only on clinical ground or on circumstantial evidence.

In 19th century, first of all in Japan epidemic encephalitis had been recognized. The virus as a causative agent was first reported by Hayashi et al(1934).

In addition to Japan, epidemic encephalitis and the activity of virus has been reported from various parts of the country. In India epidemic encephalitis was first recognized in 1955 in Vellore in North Arcot district of Tamil Nadu. Later on in other states i.e. West Bengal in 1973, Uttar Pradesh in the district of Gorakhpur in 1978, epidemic encephalitis has been reported.

District Jhansi of Bundelkhand, a backward region of Uttar Pradesh is a virgin place to conduct

REVIEW OF LITERATURE

DEFINITION

Encephalitis occurs when there is invasion of brain parenchyma by infectious agents. In such infections, meningeal involvement is almost invariably present, so that the disease called encephalitis is usually a meningo-encephalitis in which encephalitis symptoms predominate. It can be divided into primary and post-infectious or parainfectious forms and the disease may be sporadic or epidemic. The primary form of disease occurs when the encephalitis is the presenting form of the disease and is infectious agents within the CNS. The term postinfectious or parainfectious is used to describe encephalitis that follows or occurs in combination with other viral illness or administration of certain vaccines. The cause of the encephalitis in such case is believed to be hypersensitivity reaction. If the infection may extend to the spinal cord, the term encephalomyelitis is used. Encephalitis may be focal, multifocal or diffuse and may involve all elements of the brain parenchyma or restricted to specific cell population or anatomic locations.

AETIOLOGY

The term 'neurotropic virus' was formerly used to describe minute pathogenic agents which attack the nervous system.

1

Many significant contributions have been made in the field of discovery of virology neurotropic viruses. A large number of these viruses have been isolated as causative agents and the search for others is in progress.

Rabies was isolated by Pasteur in 1884, as the first neurotropic virus; following this isolation of Polio virus in 1909. Louping ill virus by Pool et al (1930), Western Equine encephalitis virus by Meyer et al (1931), Eastern Equine encephalitis virus by Broeck and Merrill (1933). St. Louis encephalitis virus by Webster and Fite (1938). Japanese B encephalitis virus Janiguochi et al (1936), Venezuelan Equine encephalitis virus by Beck and Wykoff (1938). Russian Spring summer encephalitis virus by Silber and Soloviev in 1946, Coxsackie virus in 1947. Ilheus encephalitis virus by Lamhert and Hayes in 1947, Echo virus in 1952, Murray valley encephalitis virus by French in 1952, West Nile E virus by Bernkopf et al (1953), Diphasic meningo-encephalitis virus by work in 1958, and Powassan E virus by McLean and Donohue in 1959 (Rhodes and Rooyen, 1962).

CLASSIFICATION OF PRIMARY NEUROTROPIC ENCEPHALITIS

A. Proved Viral Etiology

1. Arthropod : tick born encephalitis (Flavi virus)
(Formerly group Arbovirus).

- a. Russian (Spring summer) encephalitis.

- i. Central European encephalitis.
 - ii. Louping ill encephalitis.
 - b. Colorado tick fever.
 2. Arthropod : mosquito born encephalitis.
 - a. Group A : Alpha virus (formerly group A arbovirus).
 - i. Western equine encephalitis.
 - ii. Eastern equine encephalitis.
 - iii. Venezuelan equine encephalitis.
 - b. Group B : Flavi virus (Formerly group B arbovirus).
 - i. St. Louis encephalitis.
 - ii. Japanese encephalitis.
 - iii. Murray valley encephalitis.
 - iv. West Nile encephalitis.
 3. Polio-encephalitis - Picorna virus (Enterovirus).
 4. Rabies encephalitis (Lyssa virus).
 - Post vaccination encephalomyelitis.
 5. Haemorrhagic encephalitis.
 6. Herpes simplex encephalitis.
 7. Coxsackie disease.
 8. Echovirus encephalitis.
- B. Suspected virus Etiology**
1. Epidemic encephalitis (Von-Econome).
 2. Iceland disease.
 3. Dawson's inclusion body encephalitis.

EPIDEMIOLOGY

Although encephalitis occurs in all countries, and in all seasons, many of the agents associated with them have a definite seasonal incidence. Encephalitis caused by arthropod born viruses and enteroviruses is most common in late summer and early fall except for colorado tick fever which occurs in late springs or early summer. Encephalitis associated with lymphocytic chorio-meningitis is most common during the winter and early spring. Mumps encephalitis usually occur during out breaks of epidemic parotitis between January and May. Although sporadic cases occurs throughout the year. Encephalitis may also follow exposure to reservoirs of specific infectious agents. Meningo-encephalitis virus may follow exposure to infected mice.

Rabies is almost always acquired from an animal bite, although the incident may be remote in time and forgotten at the time of presentation.

PATHOPHYSIOLOGY

Infectious agents may reach the CNS by haematogenous dissemination from an extracranial source by neurotropic spread or by direct passage across the cribriform plate.

The haematogenous route is by far the most common. In poliomyelitis and encephalitides due to echovirus and coxsackie virus, the infectious agent is

acquired by ingestion and replication Peyr's patches and intestinal lymphatic to produce viremia and CNS involvement.

In the arthropod borne encephalitides and in Rocky mountain spotted fever, the infectious agents enters the circulation by cutaneous inoculation and replicates in vascular endothelial cells.

Several viruses may also reach the CNS by neurotropic spread along the schwann, cell sheath surrounding nerves or by retrograde movement within axons. Rabies virus enters nerve fibres at the site of an animal bite or, rarely, in the nasal mucosa and travels within peripheral nerves or the olfactory nerve to reach the spinal cord and brain.

Herpes-virus similar may reach the nervous system by neurotropic spread from a bite. Herpes simplex viruses type 1-2 also capable to neurotropic spread.

The Pathologic consequences of encephalitis are tissue destruction, inflammation and oedema. These pathologic changes may be so slight as to produce no symptoms or may produce fulminant illness and rapid death. Virtually all non-viral encephalitides as well as many of viral origin, are characterized by involvement of an element of the brain parenchyma. In these infectious necrosis of brain tissue often occurs, and if it is extensive, as in herpes simplex encephalitis, may be accompanied by haemorrhage.

In certain infection, such as Rocky mountain, spotted fever or certain case of tuberculosis, necrosis

8

is not the result of actual invasion of the brain by the organism, but rather the consequences of vascular involvement, with thrombosis of vessels and subsequent infarction.

Certain viral infections are restricted to specific cell population, such cellular specificity occurs in infections caused by poliomyelitis virus or, occasionally other enteroviruses, in which motor neurons within the spinal cord and brain-stem are commonly involved. In mumps encephalitis, extensive involvement of ventricular ependymal cells may occur. Infections may also involve specific anatomic regions. The most important examples of such anatomic specificity is herpes simplex encephalitis, in which there is preponderant involvement of the orbitofrontal cortex and temporal lobes.

In all encephalitis, inflammation is accompanied by cerebral oedema when the infection is extensive, cerebral oedema may have as a mass lesion and produce death from brain herniation.

CLINICAL PRESENTATION

Encephalitis may be sudden in onset or develops insidiously over a period of hours to days. Fever is usually, but not always, present. Headache photophobia and signs of meningeal irritations are common. The most characteristic feature of encephalitis is impairment of mental status. Intellectual impairment may be subtle early in the infection, but stupor and coma often develop

as the infection progresses. Focal neurologic abnormalities are frequently evident and may include hemiparesis, visual field defects, aphasia, and sensory neglect or abnormalities of cortical sensation. Injury to basal ganglia may result in choreoathetosis or in parkinsonian symptoms of cogwheel rigidity or bradykinesia. Cerebellar ataxia may be seen, Cranial nerve palsies may occur secondary to actual invasion by the infectious agent but are more usually due to compression entrapment of nerves within inflamed meninges.

Focal or generalized seizures may be the presenting features of encephalitis or may occur at any time during the infection.

Myoclonus is common in severe encephalitis but has a little localizing significance. Signs referable to temporal lobe olfactory or gustatory seizures, receptive dysphasia, inferior quadrantanopia, or loss of short-term memory should always suggest the possibility of herpes simplex encephalitis.

EPIDEMIC ENCEPHALITIS : JAPANESE TYPE B.
ST. LOUIS TYPE, AND MURRAY VALLEY TYPE

These varieties of epidemic encephalitis, one occurring in Japan and other Asian countries, another in United States, and third in Australia.

These diseases are all caused by viruses which measure 40-70 nm in diameter. They used to called arboviruses (meaning arthropod born) (Johnson, 1982).

The natural reservoirs of these viruses are mammals or birds, and the virus is usually transmitted to man by the bite of a mosquito or tick. The St. Louis virus is found in wild birds in the Western USA but more often in *Culex* mosquitoes breeding on stagnant water with high organic contents, in the urban midwest. Urban - epidemics of encephalitis occur in throught years because of poor drainage, while rural epidemic are more often associated with high rainfall (Johnson, 1982).

Japanese encephalitis type B is caused by virus which was first transmitted to monkey by Hayashi. Kawamura and his colleagues transmitted the virus to mice and monkeys (Inada, 1937) and showed that it was immunologically distint from the virus of the St. Louis epidemic which was also transmitted to monkeys and mice by Muckenfuss, Armstrong and McCordock (1933) and Webster and Pite (1935), Russian autumnal encephalitis is now generally regarded as idential with Japanes type B encephalitis while the Murray Valley type which occurs in Australia and New Guinea is Clinically indistingui- shable from the Japanese variety and is due to a very similar but nevertheless distinctive virus. West Nile encephalitis, and louping-ill (which is the only disease of this group to occur in Great Britain) (Webb, Connolly, Kane, 1968).

First epidemic of viral encephalitis occurred in Japan in 1871. In India the first outbreak of

encephalitis was reported by Chatterji (1945) from Calcutta, although sporadic cases have been observed in Agra in 1956, Bombay and other places. The biggest epidemics was reported in 1954 Jamshedpur, followed immediately by outbreak in Bilaspur and Nagpur in M.P., Mysore, Monghry and Patna in Bihar, Hardoi, Allahebad, Kanpur and Bareilly in U.P., Panipat, Sonapat and Ambala etc. in Punjab and also Delhi is covering a wide area of the northern India hence called as Northern India Epidemic of encephalitis.

The pathological picture in the three diseases is virtually identical except that Japanese observers described areas of softening in the brain which were not observed in the American epidemics, and in the Japanese B and Murray Valley types selective damage to purkinje cells is seen. All levels of the nervous system may be affected and severe inflammation is always found in the brain-stem, the basal ganglia, and the white matter of the hemispheres. The inflammatory changes are diffuse, involving the basal pons, the entire medulla, the cortex and white matter of the cerebellum, the basal ganglia and also cerebral cortex (Lowenberg and Zbinden, 1936; Robertson, 1952). There is neuronal degeneration, diffuse microglial and macroglial proliferation and perivascular cuffing (Reyes, Gardner, Poland and Monath, 1981).

Characteristic features of Japanese encephalitis have been described as a syndrome consisting of altered

sensorium masked like facies with tremors and symmetrical paresis without sensory loss. Occular tremors are uncommon among Indian patients (Sen Gupta et al, 1974).

Laboratory diagnosis depends upon the recognition of complement fixing and neutralizing antibodies which appear at about the seventh day (MacCallum, 1967; Hannoun Shiraki and Osetowska, 1970).

EASTERN AND WESTERN (EQUINE) ENCEPHALITIS

These forms of encephalitis have been known in the United States for many years. In 1931 it was first discovered by virus belong to the togavirus group. These viruses, though similar, are immunologically distinct, and are known as the Western and Eastern Strains (Baker, 1942).

It has been shown that various species of bird constitute a reservoir of infection, that a woodtick also harbours the virus, and that mosquitoes transmit it to man (David, 1940).

Clinical onset is sudden, with generalized headache, nausea elevation of temperature and lethargy. Focal sign of nervous involvement are usually absent, but in overt cases there are stiffness of the neck, muscular weakness and diminution of tendon reflexes. The CSP shows a moderate, predominantly mononuclear pleocytosis. Patient make a complete recovery in a week or two but mental defect, epilepsy, and spastic palsies have been observed (Finley, 1958; Aguilar, Calanchini and Finley, 1968).

POLIOENCEPHALITIS

Poliomyelitis was characterised as a distinct clinical entity only in late 19th century. Some of the historical landmarks are : the experimental transmission of the disease to monkeys (Land Steiner et al, 1909). The adoption of the virus to cotton rats and mice (Armstrong et al, 1939), the discovery that polioviruses can be grown in primate, non neuronal tissue (Fuders et al, 1941).

Paralytic poliomyelitis was recognised in India only in 1947 when one of the most severe epidemics occurred in the Andaman Island. In 1949, it was noted in Bombay and since then, the number of cases appears to be rising progressively in different parts of the country. The virus spreads from human to human through polluted water or food, the most important source of contamination being human faeces.

In Bombay, seasonal incidence is marked 60 per cent of cases are recorded during June to September as evident from ICMR(1975), recent studies in Poliomyelitis.

The virus of poliomyelitis consistently involves the cerebral hemispheres, producing meningitis, mesodermal glial reaction and neuron damage. The meningeal reaction is invariably mild and implicates all cortical areas; however, the posterior portion of the frontal lobes are by far the most commonly involved. The neuronal changes are strikingly localized to the large and giant

pyramidal cells of layer 5 and the medium pyramidal cells of layer 3 of the motor cortex. These nerves cells reveal chromatolysis, swelling fragmentation and pyknosis. Relatively extensive inflammatory changes present in the motor area consist of diffuse and focal areas of inflammatory cells. Glial nodules are few (Baker and Buggs et al, 1954).

In the "Paralytic poliomyelitis (polioencephalitis) paralytic stage it is almost impossible to differentiate these cases from the cases of viral encephalitis besides those caused by the polio virus as both these syndromes have almost the similar type of presentation alongwith the signs of encephalon involvement. Although in the polio infection limb pain and tenderness will be prominent finding in the limb usually later on weakened in the paralytic stage. This may raise the suspicion in the mind but the diagnosis of these cases in preparalytic stage is confirmed only by virus isolation of poliomyelitis. Those cases which pass on to the manifestation of paresis or paralysis of the limb or limbs with persisting or residual evidence of brain substance injury, are easier to diagnose clinically. Viral studies show that fewer than 40% of the cases of nonparalytic poliomyelitis are actually this disease.

Commenting upon the age incidence of poliovirus affection Brain has described that infants under the age of one year are rarely attacked. In country where hygiene

is poor most sufferer are between the age of 2 and 4. After the age of 25 disease is very rare. Male suffers some what frequently than females.

Meyer et al (1953-58) separately grouped 144 cases under the syndrome of "paralytic poliomyelitis". Eighty percent of these cases have been virologically proved to be cases of poliomyelitis. Some of the cases clinically diagnosed as aseptic meningitis and encephalitis were virologically proved of polio-virus affection. Thus its similarity clinically with other two syndromic obvious.

Agarwal et al (1954) reported 53 cases from Allahabad. Seventy five percent of the cases were below 5 years of age. Thirteen cases had the involvement of brain stem and 4 of them died of respiratory complications. Bulbo encephalitis form was observed in 3 patients which showed equivocal signs of encephalitis with involvement of spinal and brain stem. One boy of 15 years presented with headache, semicoma, coarse tremors of limbs, restless, besides fever. He was diagnosed to be a case of polio encephalitis with involvement of brain stem and respiratory muscles but recovered completely.

RABIES ENCEPHALITIS

The history of rabies is indeed ancient forming a part of the natural history of animals. From the earliest period, the disease had been associated with mad dogs whose bites could transmit the virus to other animal

and humans through the saliva (Bell et al, 1964). The efforts of many to transmit the disease from man to animal culminated in Pasteur's classical studies and his ultimate success in 1886 of treating cases of dog bite. In 1903, Negri discovered certain bodies, the well known Negri bodies which he considered, to be the aetiological agent, supposedly a protozoan. This has proved to be in-correct. However, electron microscopy has shown that these bodies contain virus particles of rabies.

The virus of rabies belongs to the family rhabdoviridae in the group Lyssavirus. The concept of rabies virus as a single antigenic species, was challenged and now it has been shown to be a member of serologically related viruses which can be distinguished readily (Shop et al, 1976).

Rabies had a world-wide distribution. In India, it has been endemic for thousands of years and shows an alarming increase in incidence. It is the most common form of encephalitis in India. Like Japanese encephalitis, rabies is also a zoonosis involving different wild and domestic animals. In India, where the stray dog population remains unrestricted, dogs have been responsible for 89.2 percent and Jackals for 6 percent of the 44,869 persons who underwent treatment with vaccine (ICMR, 1973). On the other hand, a variety of animals including foxes, skunks, raccoons and bats have been involved in rabies epidemiology in countries where

dog rabies is generally controlled (Winkle, 1974; Parker et al, 1966; WHO expert committee report, 1973).

In India, only one case was noted following the bite of a bat (Veeraraghwan et al, 1955). Hattwick and Gregg (1975) have illustrated statistically accordingly, if a rabid wolf bites more than one person within a short period of time, and if at least one of them dies of rabies, the probability is that about 60 percent of the bitten individuals will develop clinical rabies. In the case of a severe bite by a proved dog, only 32 percent of infected persons will developed fatal rabies. The figures will be reduced if they receive effective treatment after exposure.

A serious problem raised is the possibility of developing disease through bites of apparently, healthy dogs who remain healthy during the period of observation. This question of latent and abortive rabies has been reviewed by Bell et al (1964). In India, there was a report of a normal looking dog who showed virus in the saliva at intervals of 14 occasions between 75 to 180 days after biting a person who developed fatal rabies. The saliva was found to be negative when followed for another 34 months (Veeraraghwan et al, 1969).

The usual incubation period of rabies varies between 20 to 60 days. It is shorter (34-48 days) with head bites than with bites on the extremities (46-78 days) (Ahuja et al, 1950).

Prodromal symptoms of pain and tingling at the site of the bite or anxiety and restlessness with anorexia, headache and fever are followed in 2-10 days by the neurological syndrome. This consist of hallucination, disorientation, convulsions, neck stiffness and paralysis. Short bouts of excitement with psychomotor activity, running and thrashing of limbs, may characterize this phase. These last a few minutes and then the patient become quiet and cooperative by anxious. Pharyngeal and generalized spasms characterize this phase. These pharyngeal spasms are brought on by attempts to swallow, water and later even by the mere sight of water (Ahuja et al, 1950). The patients begins to fear water and gets disturbed by noise or excess of light. The paralysis may be diffuse and symmetrical or ascend as in the Guillain Barre syndrome until there is respiratory paralysis followed by unconsciousness and death (Dupont et al, 1965).

Diagnosis is possible through actual isolation of virus by inoculation of experimental animals or through visualization of Negri bodies (Johnson et al, 1964). The fluorescent antibody technique provides a rapid and reliable method for identifying rabies antigen in tissues of infected animals (Goldwasser et al, 1958). Other methods include serum neutralization testes (Lennette et al, 1971). The indirect fluorescent rabies antibody test (Thomas et al, 1963).

HERPES SIMPLEX ENCEPHALITIS

It is caused by DNA virus in the family Herpatoviridae, genus Herpes virus. The virus has two distinct serotypes, type 1 being mainly associated with encephalitis (Gupta et al, 1972). It is a common cause of sporadic acute encephalitis and has a world-wide distribution.

There is an acute onset of fever, headache, apathy and convulsions; less of consciousness usually occur by the sixth or seventh days of illness while rhythmic movements of the larynx and pharynx are very common. Evidence of rising intracranial tension deepening unconsciousness and papilloedema often demand surgical decompression.

The CSF shows elevation of proteins with increase in lymphocytes. Millipore filter examination of the CSF may reveal large eosinophilic cells with intranuclear inclusion (Gupta et al, 1972). The EEG shows diffuse slowing widespread, periodic stereotyped sharp and slow wave complexes, bilaterally over both hemispheres or transient episodes of active unilaterally. These are similar to those found in SSPE but with shorter periodicity and only in the acute phase of the illness. In addition the EEG may show a localized sharp and slow waves abnormality in 66 percent of proven cases (Gupta et al, 1975).

KYASANUR FOREST DISEASE (KFD)

KFD virus is an RNA virus placed in the family Togaviridae genus *Flavivirus* i.e. the same group B of arboviruses as the JE virus. In this group, it belongs to the subgroup known as the Russian spring summer encephalitis viruses, most of which are known as to be transmitted by bites of ticks.

The disease was first reported in monkey and men from the Kyasanur forest (Shimoga District, Karnataka State, S. India) (ICMR, 1973, Research in rabies).

Recently the virus has also been isolated from human in N. Canara District (Karnataka states) (Winker et al, 1974). Apart from these two areas in Karnataka state KFD has been reported only in laboratory workers (Wadia et al, 1975).

The initial illness characterized by fever headache, myalgia, sore throat, cough, abdominal pain and diarrhoea lasts for a 8 or 9 days. After a period varying from 10-12 days of normal temperature, the fever reappears. It is in this stage that the CNS may becomes affected. Headache and vertigo are complained of an abnormal deep reflexes with equivocal plantar responses, meningeal signs and mental disturbances are observed (Webb et al, 1961).

The CSF shows a polymorph or lymphocytosis with normal chemistry. However, the EEG may be abnormal in the first phase of the illness (Wadia et al, 1975).

POST INFECTIONS ENCEPHALITIS

The encephalomyelitis complicating varicella, rubella and variola are known to be result of an immunological reaction within the brain involving principally the white matter. However, the measles virus has been isolated from the brain itself and it is possible that measles encephalitis could be a result of invasion of the brain by the virus together with an early development of antibody response of the host (Webb et al, 1964).

Indian reports give the incidence of measles encephalitis to vary between 2-20 percent children under three years are most liable to this complication. Mumps encephalitis appears to be more infrequent and may occur following only an orchitis, by itself or following the parotitis. Agarwal et al (1971) found antibodies in CSF to adenovirus in 22, mumps in 11, and measles in 13 of 59 patients suffering from virus encephalitis.

Following a skin rash and high fever, or an enlargement of the parotid gland, at an interval varying from 2-14 days. These may be either a sudden convulsion, with loss of consciousness or a more gradual and progressive drowsiness passing into stupor and coma, preceded by irritability, headache and signs of meningeal infection. Involuntary movement, hemiplegia, ataxia, and speech disturbances may occur.

The CSF usually shows an elevation of lymphocytes and proteins, with normal sugar and chloride

and quadriplegic, with pyramidal and extrapyramidal signs. The jerks persist till a late stage of illness. The course lasts about 18 months.

The CSF may show a paretic colloidal gold curve. The EEG is characteristic, stereotyped repetitive complexes (which are superimposed in a given channel) occur on a background which shows progressive slowing. The origin of these discharges is probably within deep brain structures. There are numerous case reports in the Indian literature (Gupta et al, 1975; Singhal et al, 1974; Sayeed et al, 1975).

AIMS OF THE STUDY

Bundelkhand region is south west region of Uttar Pradesh. Till now no reports are available on encephalitis, although encephalitis is not very uncommon in this region by looking the record of Medical Record Section of M.L.B. Medical College, Jhansi.

Our aim was to select out the encephalitis patients by clinical study and to evaluate the following:

1. The incidence of encephalitis in hospitalised patients of M.L.B. Medical College, Jhansi.
2. Prognosis of viral encephalitis.
3. Mortality and morbidity due to encephalitis.

M A T E R I A L A N D M E T H O D S

One hundred thirteen clinically diagnosed cases of encephalitis were taken for the present study. The cases included in the study belonged to medical wards (patients above 12 years of age), paediatric ward (patients below 12 years of age) and psychiatry wards of M.L.B. Medical College, Jhansi and District Hospital, Jhansi. Cases of both sexes and all the age groups were included in the study.

A detailed history, clinical examination and investigations were carried out in all the cases.

METHODS

All the cases were evaluated on the following lines :

I. CLINICAL HISTORY

Following complaints were considered for the selection of the cases :

- | | |
|--------------------------|----------------------------|
| 1. Acute febrile illness | 2. Headache |
| 3. Vomiting | 4. Alteration in sensorium |
| 5. Delusion | 6. Convulsion |
| 7. Irrelevant behaviour | 8. Generalised weakness |

General history with especial emphasis on details of disorder was also taken.

1. History of epidemiological features such as season and geography (encephalitis lethargica more common in winter and early spring) and insect or animal exposure (dog bite).
2. History of vaccination (Post infectious encephalitis).
3. History of gastro-intestinal disturbances (Poliovirus).
4. History of respiratory catarrh or Coryza (Influenza and adenovirus).
5. History of severe shooting or burning pain with skin hyperalgesia, preceding the appearance of the skin eruption vesicles on an erythematous back ground by 2-4 days (Herpes Zoster).

II. CLINICAL EXAMINATION

Clinical examination especially nervous system was performed and clinical symptomatology was recorded.

General Examination :

- | | |
|----------------------|-----------------|
| 1. General condition | 2. Nutrition |
| 3. Pulse | 4. B.P. |
| 5. Icterus | 6. Pallor |
| 7. Cyanosis | 8. Clubbing |
| 9. Temperature | 10. Respiration |
| 11. Hydration | 12. Lymphnode |
| 13. Oedema | |

Systemic Examination

- A. Cardiovascular system.
- B. Respiratory system.

C. Alimentary system.

D. Central Nervous system.

a. Higher Function :

- | | |
|--------------------------------|--------------------------------------|
| 1. Appearance and
behaviour | 2. Emotional state |
| 3. Intelligence | 4. Orientation in time
and place. |
| 5. Memory | 6. Consciousness |
| 7. Right or left handed | 8. Delusion |
| 9. Delirium | 10. Hallucination |
| 11. Speech. | |

b. Cranial Nerves :

- | | |
|---------------|---------|
| 1st CN | IInd CN |
| III, IV, V CN | VI CN |
| VII CN | VIII CN |
| IX, X CN | XI CN |
| XII CN | |

c. Fundus examination

d. Motor Function :

- | | |
|---------------------------------|--------------------------|
| 1. Power | 2. Bulk of muscles |
| 3. Tone of muscles | 4. Reflexes : |
| | i. Superficial |
| 5. Coordination of
movement. | ii. Deep |
| 6. Gait | 7. Involuntary movement. |

e. Sensory system :

- | | |
|-------------------|------------------------|
| 1. Touch - Fine | 2. Thermal sensibility |
| - Coarse | 3. Pain |
| 4. Position sense | 5. Vibration |

6. Cortical sensation :

- Tactile localisation
- Tactile discrimination
- Tactile extinction and astereognosis.

f. Organic Reflexes :

- Neck rigidity
- Kernig's sign

g. Cerebellar signs :

- | | |
|-----------------------|----------------------|
| 1. Ataxia | 2. Intention tremors |
| 3. Nystagmus | 4. Atonia |
| 5. Rebound phenomena | 6. Dysarthria |
| 7. Pendular knee jerk | 8. Adiadochokinesia |
| 9. Romberg's sign | |

h. Extra Pyramidal signs

III. INVESTIGATIONS:

The following investigations were done to support the clinical diagnosis of encephalitis.

1. TLC, DLC, Hb and ESR.
2. Blood sugar (fasting and postprandial) to exclude diabetes.
3. G.B.P. was done by peripheral blood smear using Leishman stain to exclude malarial encephalopathy.
4. Serum creatinine and blood urea were also estimated to exclude uraemic encephalopathy.
5. Serum bilirubin, serum alkaline phosphatase, A/G ratio, were done to exclude hepato-encephalopathy.

O B S E R V A T I O N S

Ninty patients who were admitted with features of intracranial infection viz. fever, headache and altered sensorium in medical and paediatric wards of M.L.B. Medical College, Hospital, Jhansi during a period from 20.8.90 to 19.8.91 were selected and investigated for this study.

Out of those 90 cases, 10 cases were suffering from tubercular meningitis and 12 cases were suffering from septic meningitis on the basis of C.S.F. findings. Some of them were having focal neurological deficit could even be cases of brain abscess. The facilities for CAT scanning were not available in this hospital to confirm or requite it. Eight cases were having highly positive widal test and were labelled as cases of enteric encephalopathy (Table I). After excluding 30 cases of TBM, septic meningitis and enteric encephalopathy the remaining 60 cases were of viral encephalitis.

TABLE I : Distribution of cases according to their clinical diagnosis.

Diagnosis	No. of cases	Percentage
Viral mencephalitis	60	66.7
Non-viral intracranial infection		
- T.B.M.	10	11.1
Septic meningitis	12	13.3
Enteric encephalopathy	8	8.9
TOTAL	90	100.0

CLINICAL SPECTRUM : It consists of 60 cases of viral encephalitis.

I. NATURAL HISTORY

a. Age Incidence

All the cases were in the age group from 2 to 70 years. The 16(26.7%) cases were in the age group of 16-20 years. Twenty two (36.67%) cases were in the paediatric age group i.e. below 12 years of age. Age distribution of cases is shown in table II.

TABLE II : Distribution of cases according to their age.

Age group (years)	No.of cases	Percentage
0 - 5	18	30.0
6 - 10	2	3.3
11 - 15	5	8.3
16 - 20	16	26.7
21 - 25	10	16.7
26 - 30	4	6.7
31 - 70	5	8.3
TOTAL	60	100.0

b. Sex Incidence

Out of total 60 cases, 38(63.3%) cases were males and remaining 22(36.7%) cases were females.

TABLE III : Distribution of cases according to their sex.

Sex	No. of Cases	Percentage
Male	38	63.3
Female	22	36.7
TOTAL	60	100.0

c. Socio-economic status

Table IV shows the distribution of cases according to their socio-economic status. There was no case of upper socio-economic status in the study. Fifty six (93.3%) cases were lower and 4(6.7%) cases were from middle socio-economic status.

TABLE IV : Distribution of cases according to their socio-economic status.

Socio-economic status	No. of Cases	Percentage
Upper	-	-
Middle	4	6.7
Lower	56	93.3
TOTAL	60	100.0

d. Clinical onset, course and duration of illness

1. The maximum 97.2% cases were having characteristically acute onset and the rest 2.8% cases were having insidious onset.
2. The temperature ranged from 98°F to 104°F. Fever was subsided in most of the cases in 3-9 days but only in two cases it was lasted for two weeks.

3. Varied disturbances of consciousness were noticed. Severe degree of impairment in consciousness was present. Mental clearing in patients with drowsiness, confusion and delirium occurred in 2-7 days usually.
4. Patients presenting with unconsciousness took 7 days to 3 weeks for clearing up the mind and these patients had some residual effects or the other usually at the time of discharge.
5. Meningeal signs, headache and vomiting usually subsided in 3-9 days.
6. Convulsions were controlled with proper sedation within 1-3 days. The tremors although persisted till discharge in 2 cases.
7. Symptoms usually subsided rapidly in hospital with usual line of management consisting of broad spectrum antibiotics, prednisolone and sedatives etc. besides carefully maintaining adequate fluid and electrolyte balance and nutrition.
8. Complications : During the course of illness the number of complications were recorded. The significant complications were bed sores in 24 cases, diarrhoea in 4 cases, urinary tract infection in 6 cases, aspiration pneumonia in 8 cases, eye congestion in 3 cases and psychiatric changes in 1 case.
9. History of dog bite was found in 1 case. Incubation period was 20-25 days, prodromal symptoms were pain and tingling at the site of bite, anxiety, headache

and fever in 5 days. The neurological symptoms were hallucination, disorientation, and convulsion. Neck stiffness and paralysis was symmetrical in both upper and lower limbs and patients died within 3 days due to respiratory arrest.

10. History of oral polio-vaccines in 6 cases 2-3 years of age group. Clinical features developed after 7-14 days. Fever subsided after 3-8 days. Varying levels of consciousness was observed which lasted for 5-7 days. Meningeal sign, vomiting, and diarrhoea subsided after 5-6 days. There was flaccid paralysis and wasting of one limb in asymmetrical fashion. In some cases paralysis occurred in all the four limbs and trunk muscles. The lower limbs were more affected than the upper.

II. CLINICAL SYMPTOMS

A variety of symptoms were observed in all the 60 cases. Chief presenting symptoms recorded were fever (acute infection), symptoms of cerebral irritation (inflammation) as convulsion and altered consciousness and symptoms of raised intracranial tension i.e. vomiting and headache as well as gastrointestinal upset as diarrhoeal manifestation (Table V).

TABLE V : Distribution of the cases according to their clinical symptoms.

Symptoms	No. of cases	Percentage
Fever	59	98.33
Headache	52	86.71
Giddiness	12	20.00
Vomiting	51	85.00
Convulsion	44	73.33
Irrelevant behaviour	58	96.7
Alteration in sensorium	60	100.0
Hallucination	16	26.7
Generalised weakness	24	40.0
Diarrhoea	3	5.0

III. CLINICAL SIGNS

a. General Examination

1. General Condition

All the patients were in poor general condition with varying degree of altered sensorium.

2. Temperature

Fever was recorded as the most important presenting signs. The table VI shows the distribution of cases in different ranges of temperature.

Pyrexia was noted varying from 98 to 104°F. Out of total 60 cases, 28 (46.7%) were having pyrexia between 100-102°F.

TABLE VI : Distribution of cases according to their temperature.

Range of Temperature (° F)	No.of cases	Percentage
Upto 100	6	10.00
100 - 102	28	46.7
102 - 104	26	43.3
TOTAL	60	100.0

3. Pulse

Tachycardia (after correction for rise in temperature) was noted in 9 cases. No other abnormality in pulse was recorded in these cases.

4. Respiration

Increased rate of respiration was recorded in 32 (53.33%) cases.

5. Blood Pressure

It was found to be normal in all the cases except in 5(8.4%) cases who were in hypotension and had subnormal temperature at the time of admission.

b. Systemic Examination

A careful examination of all the systems was conducted with stress over the neurological findings.

1. Nervous system

a. Higher function

Appearance and behaviour : All the patients were acutely ill with altered behaviour.

Intelligence, orientation in time and place, memory could not be assess at the time of admission in majority of the cases due to acute illness and disturbed sensorium.

b. Consciousness

Gross changes in consciousness are common accompaniment in encephalitis due to inflammation of brain tissue. Various levels of consciousness were recorded in table VII.

TABLE VII : Distribution of cases according to their consciousness.

Consciousness	No. of cases	Percentage
Comatose	3	5.0
Semiconscious	37	61.7
Confusion and drowsiness	17	28.3
Delirious	3	5.0
TOTAL	60	100.0

c. Hallucination was present in only 23 (38.3%) cases at the time of admission.

d. Cranial nerve examination : Table VIII shows the signs of cranial nerves lesion.

TABLE VIII : Showing the signs of cranial nerves lesion.

Cranial nerve lesions	No. of cases	Percentage
Pupillary changes with light reflex		
- Dilated with sluggish reaction to light.	29	48.33
- Dilated with no reaction to light.	10	16.70
Corneal reflex and conjunctival reflex		
- Sluggish	20	33.33
- Absent	9	15.00
Facial paresis (Unilateral supranuclear).	10	16.70
Nystagmus	6	10.00
Gag reflex	10	16.70

e. Fundus examination : On fundus examination papillo-dema was present in 10(16.7%) cases.

f. Motor system

1. Power of muscles : Table IX shows the incidence of various grade of power observed in cases.

TABLE IX : Showing the incidence of various grade of power of muscles.

Grade	No. of cases	Percentage
Grade 0/5 Rt upper & lower limb	11	18.4
Grade 0/5 Rt & Lt upper and lower limb	10	16.7
Grade 3/5 Rt upper & lower limb	2	3.3
Grade 3/5 Rt & Lt upper and lower limb	35	58.3
Grade 4/5 Rt and left upper and lower limb.	2	3.3
TOTAL	60	100.0

2. Bulk of muscles : Bulk of muscles were almost normal in all the cases.
3. Tone : Hypertonia was present in 32 (28.3%) cases.
4. Coordination : It could not be examined in majority of cases due to acute illness and disturbed sensorium.
5. Reflexes : Table X shows the incidence of various types of reflexes elicited.

TABLE X : Showing the superficial reflexes.

Abdominal reflexes	No. of cases	Percentage
Diminished right side upper & lower part.	14	23.3
Diminished B/L upper & lower part	42	70.0
Cremasteric : absent	22	36.7
<u>Plantar reflexes</u>		
Plantar extensor right side	10	16.67
Plantar extensor B/L	30	50.00
Plantar not elicited	20	33.33

TABLE XI : Showing the deep reflexes.

Reflexes	No. of cases	Percentage
<u>Biceps</u>		
Exaggerated right side	12	20.00
Exaggerated right and left side	30	50.00
Not elicited	13	21.67
Sluggish	5	8.33

TOTAL	60	100.00

<u>Triceps</u>		
Exaggerated right side	12	20.00
Exaggerated right & left side	30	50.00
Not elicited	13	21.67
Sluggish	5	8.33

TOTAL	60	100.00

<u>Supinator</u>		
Exaggerated right side	12	20.00
Exaggerated right and left side	30	50.00
Not elicited	13	21.67
Sluggish	5	8.33

TOTAL	60	100.00

<u>Knee jerk</u>		
Exaggerated right side	12	20.00
Exaggerated right and left side	30	50.00
Not elicited	13	21.67
Sluggish	5	8.33

TOTAL	60	100.00

<u>Ankle jerk</u>		
Exaggerated right side	12	20.00
Exaggerated right and left side	30	50.00
Not elicited	13	21.67
Sluggish	5	8.33

TOTAL	60	100.00

Ankle Clonus : Right side	4	6.70

6. Gait : It could not be examined at the time of admission in majority of cases due to acute illness and disturbed sensorium. Later on 10(16.7%) cases were in spastic gait and one patient had cerebellar ataxia.

9. SENSORY SYSTEM

Sensory system could not be examined on admission due to impairment of a consciousness in majority but later on examination did not show any significant observation in this regard.

h. INVOLUNTARY MOVEMENTS

This comprises of convulsions a significant presentation of encephalitis besides tremors. The table XII shows their incidence.

TABLE XII :

Involuntary movement	No.of cases	Percentage
Generalised convulsion	32	53.33
Convulsion remain in the limb	12	20.00

Convulsion is a sign of cortical irritation is a very important finding in encephalitis and was observed in 32(53.33%) cases generalised type and in 12(20%) cases partial type.

1. ORGANIC REFLEXES

Signs of meningeal irritation were consisting of neck rigidity and Kernig's sign. Table XIII shows the percentage of meningeal irritation.

TABLE XIII : Showing meningeal irritation.

Meningeal irritation	No. of cases	Percentage
well marked	20	33.33
Minimal	24	40.00

1. CEREBELLAR SIGNS

Cerebellar signs could not be examined during admission in majority of cases due to altered sensorium. Later on one patient had cerebellar ataxia.

2. CARDIOVASCULAR SYSTEM

In all the cases CVS examination was normal 1st and 2nd heart sounds were normally audible. No abnormal sound was detected.

3. RESPIRATORY SYSTEM

In all the cases chest bilateral symmetrical movement of chest were normal. Bilateral vesicular breathing were present except in few cases in which bilateral occasional crepts were present.

4. ALIMENTARY SYSTEM

In all the cases abdomen was soft, no hepato-splenomegaly and there was no evidence of fluid in peritoneal cavity.

NON-VIRAL INTRACRANIAL INFECTIONS

Out of 90 cases, 22 cases were having non vital intracranial infections.

I. NATURAL HISTORY

a. Age Incidence

Cases were in the age from 2-40 years. Out of 22 cases, 6(27.4%) cases were in the age group of 16-20 years. Seven cases were in the paediatric age group i.e. below 12 years of age and remaining 9 cases were in the age group of 21-40 years.

b. Clinical Onset, courses and duration of illness

1. The onset was characteristically insidious in 16(72.7%) cases and rest 6(27.3%) cases were having episodic onset.
2. Temperature ranged from 100-104°F. In majority (80%) of the cases fever was subsided in 4-15 days but in 20% cases temperature subsided on 20th day of illness.
3. Varied disturbances in the level of consciousness i.e. drowsiness, confusion, lethargy, delirious were noticed which usually took only a couple of days (2-5) to clear up.
4. Meningeal signs, headache and vomiting (evidence of raised intracranial tension gradually subsided in 3-6 days usually.
5. Convulsions were controlled with proper sedation in 2-3 days.

6. Symptoms were usually subsided rapidly in hospital with usual line of management consisting of broad spectrum antibiotics, prednisolone and sedation etc. besides carefully maintaining adequate fluid and electrolyte balance and nutrition, back, bladder, bowel and clear air way.
7. During the course of illness the number of complications were recorded. The significant complications were bedsores in 8 cases, mouth ulcer in 6 cases, urinary tract infection and aspiration pneumonia in 4 cases each.
8. The mortality rate was recorded to be 18.2%(4 cases). Total duration of hospitalization (i.e. illness) took from 4-10 days to maximum of two weeks.

II. CLINICAL SYMPTOMS

The presenting symptoms were observed in the 22 cases of non-viral intracranial infection. Chief presenting symptoms recorded were fever, symptoms of cerebral irritation (inflammation) as convulsions and altered consciousness and symptoms of raised intracranial lesion i.e. vomiting and headache as well as gastro-intestinal upset as diarrhoeal manifestations.

III. CLINICAL SIGNS

a. General Examination

1. General Condition : All the patients were in poor general condition with moderate disturbance of altered sensorium.

2. Temperature: Pyrexia was noted varying from 100-104°F out of total 22 cases, 14(63.6%) were having temperature between 100-102°F and remaining 8 cases were having temperature between 102-104°F.

b. Systemic Examination

Careful examination of all the systems was conducted with stress over the neurological findings.

1. Nervous System

- a. Appearance and behaviour - all the patients were actually ill with altered behaviour.
- b. Consciousness : Out of 22 cases, 20 were semi-conscious and remaining two were delirious.
- c. Hallucination : It was present in only 4(18.2%) cases at the time of admission.
- d. Cranial nerve examination :
 - Dilated and sluggishly reacting pupils were observed in 10(45.4%) cases and facial palsy were observed in 6(27.3%) cases.
- e. Fundus examination : On fundus examination papilloedema was present in 6 (27.3%) cases.

f. Motor & Sensory Systems

Deep tendon reflexes were exaggerated right side of body in 5(22.7%) cases and bilateral upper and left side in 10(45.45%) cases. Superficial reflexes were diminished right side upper and lower part of

abdomen in 10(45.45%) cases. Plantar were extensor right side in 5(22.7%) cases and in 4 cases, it was not elicited.

Sensory system could not be examined properly on admission due to impairment of consciousness but later on examination did not show any significant observation in this regard.

g. Gait:

It could not be examined at the time of admission in majority of cases due to disturbed sensorium. Later on, 2(9.1%) cases were in spastic gait.

h. Involuntary Movement

There were generalised convulsions in 13(59.1%) cases and remaining 9(40.9%) cases were having convulsions in the limbs.

i. Organic reflexes

Signs of meningeal irritation were observed in 20 cases. Out of 20 cases, 12(54.51%) cases showed minimal signs of meningeal irritation and remaining 8(36.4%) cases showed well marked signs of meningeal irritation.

j. Cerebellar signs

Cerebellar signs could not be examined during admission in majority of the cases due to altered sensorium. Later on no significant abnormality was detected.

2. Cardiovascular system:

In all the cases cardiovascular examination was normal.

3. Respiratory system

In all the cases chest was bilaterally symmetrical, movement of chest was normal, vesicular breathing was present except in 4 cases in which bilaterally coarse crepts were present.

4. Alimentary system

In all the cases alimentary system was normal.

CLINICAL OBSERVATIONS OF ENTERIC ENCEPHALOPATHY

CLINICAL SPECTRUM

There were 8 cases of enteric encephalopathy in the present study.

I. Natural History

a. Age Incidence : All the 8 cases were in the age group of 6-25 years. Three cases were in the pediatric age group.

b. Sex Incidence : Out of 8 cases, 7(87.50%) cases were males and only 1 case was female.

c. Clinical onset course and duration of illness

1. The maximum cases were having characteristically insidious onset.

2. Malaise, headache, bodyache, abdominal discomfort, anorexia, slight diarrhoea with intermittent constipation usually subsided in most of the cases in 4-6 days.
3. Temperature ranged from 100-103°F showing step ladder rise pattern higher in evening with chills and rigor was subsided in most of the cases in 4-10 days.
4. Spleen was palpable about 2-4" in most of the cases.
5. Symptoms usually subsided rapidly in hospital with usual line of management consisting of antibiotics (Chloramphenicol), prednisolone and sedative etc., besides carefully maintaining adequate fluid and electrolyte balance and nutrition, back bladder, bowel and airway clear.
6. There was no mortality in enteric encephalopathy cases.

II. CLINICAL SYSTEMS

A variety of symptoms were observed in all the cases. They included mainly, fever, headache, irrelevant behaviour in all 8 cases, whereas vomiting and altered sensorium in 7 cases.

III. CLINICAL SIGNS

a. GENERAL EXAMINATION

1. General condition: All the patients were in poor general condition with disturbance of altered sensorium.

2. Temperature : Pyrexia was noted from 100-103° F with chills and rigor in most of the cases usually raised at evening.

b. SYSTEMIC EXAMINATION

A careful examination of all the systems was conducted with stress over the neurological findings.

1. Nervous system

- a. Higher function

1. Appearance and behaviour : All the patients were looking ill with altered sensorium.

- b. Consciousness

Only 1 case was semiconscious. Confusion was found in 3(25%) cases and the remaining 4(50%) cases were delirious.

- c. Cranial nerve examination

No significant observation was made in this context. Pupils were normal in size and were normally reacting to light.

- d. Fundus examination

Fundus examination was normal in all the cases.

- e. Motor and sensory systems

Deep tendon reflexes were exaggerated bilaterally in 1(12.5%) cases and in rest of cases, all the

reflexes were normal. Plantar was extensor bilaterally in one case (12.5%) and was normal in rest 7(87.5%) cases. Sensory system could not be examined properly on admission due to impaired consciousness but later on on examination did not showed any significant observation in this regard.

f. Involuntary Movement

Generalised convulsions were observed in 2(25%) cases.

g. Gait

It could not be observed at the time of hospitalisation due to impaired in consciousness, but later on no significant abnormality was detected.

h. Organic reflexes were absent in all the cases.

i. Cerebellar signs

Cerebellar signs could not be examined in majority of cases due to altered sensorium. Later on no significant abnormality was detected.

2. Cardiovascular system

In all the cases C.V.S. examination was normal.

3. Respiratory system

In all the cases respiratory system was normal.

3. Alimentary systems

Abdomen was soft of all the cases. Spleen was just palpable in 7(87.5%) cases, soft in consistency, non tender, smooth in surface and there was not any evidence of fluid in peritoneal cavity.

LABORATORY INVESTIGATIONS

All the patients were investigated for haemoglobin, total and differential leucocyte count of white blood cells.

A. HAEMOGLOBIN ESTIMATION

In majority of cases haemoglobin values were found to be on lower side of normal. Values above 12 gm% were found in only 6(5.4%) cases.

B. TOTAL W.B.C. COUNT

Range of W.B.C. count in all the patients was 4,000 - 16,000 cells/cumm.

TABLE XIV : Showing the total W.B.C. count.

Cells (Thousand/cumm.)	No. of cases	Percentage
Above 4 - 6	8	8.9
Above 6 - 8	19	21.2
Above 8 - 10	23	25.5
above 10 - 12	32	35.5
Above 12	8	8.9
Total	90	100.0

C. DIFFERENTIAL W.B.C. COUNT

1. Polymorphonuclear count

The range of polymorphonuclear count was recorded from 30 to 84 cells percent. The values above normal 40-84 cells were in 38(42.2%) cases, and below normal in 52(57.8%) cases.

2. Lymphocyte count

The range of lymphocyte count varied from 16-67 percent cells. Cell count above normal was in 60(66.7%) cases and below normal was in 30(33.33%) cases.

3. Eosinophil count

The range of eosinophil count was from 0-7% in all the cases.

D. ERYTHROCYTE SEDIMENTATION RATE

The range of ESR varied from 10-20 mm in 1st hour in all the cases.

E. BLOOD SUGAR

The range of random blood sugar varied from 80-150 mg% in all the cases.

F. BLOOD UREA

The range of blood urea varied from 10-40 mg% in all the cases.

G. SERUM CREATININE

The range of serum creatinine varied from 0.7-1 mg% in all the cases.

H. SERUM BILIRUBIN

The range of serum bilirubin varied from 0.2 to 1 mg% in all the cases.

I. WIDAL TEST

The range of end titer of TH antigens were 1 : 20 to 1 : 160 and in 8 cases it was above normal

J. SERUM SODIUM AND POTASSIUM

The normal value of serum sodium was 139-144 m eq/l and serum potassium was 3.3 - 4.7 m eq/l in all the cases.

K. URINE EXAMINATION

Table XV shows the urine analysis in all the cases.

TABLE XV : Showing urine analysis in all the cases.

Urine analysis	No. of cases	Percentage
Albumin (+)	10	12.20
Albumin (-)	72	87.80
Sugar (-)	82	100.00
Pus cells (0-5)	82	100.00

L. X-RAY CHEST PA VIEW

X-ray chest almost normal in all the cases except few cases in which lung congestion was found.

M. CEREBROSPINAL FLUID EXAMINATION

C.S.F. examination was done in 82 cases. Tension were found increased in 62 cases and it was normal in 20 cases. Colourless (clear) C.S.F. was found in 70 cases and turbid in colour was found in rest of 12 cases and fine coagulum form on standing only in 10 cases (Table XVI).

TABLE XVI : Showing C.S.F. examination.

Colour/standing	No. of cases	Percentage
Clear	60	73.2
Clear and fine coagulum	10	12.2
Turbid	12	14.6
TOTAL	82	100.0

BIOCHEMICAL EXAMINATION

Proteins

Range of protein in C.S.F. was found from 20-300 mg% when normal value of protein is 15-45 mg%.

TABLE XVII : Showing the protein values in C.S.F.

Protein (mg%)	No. of cases	Percentage
20 - 50	1	1.2
50 - 200	72	87.9
200 - 300	9	10.9
TOTAL	82	100.0

Sugar

Normal range of sugar is 45-80 mg%. The value of sugar was ranged from 20-80 mg% in selected cases (Table XVIII).

TABLE XVIII : Showing the sugar values.

Sugar (mg%)	No. of cases	Percentage
20 - 40	22	26.9
40 - 80	59	71.9
80 - 90	1	1.2
TOTAL	82	100.0

Table XVIII shows that 22 cases were having sugar values below the normal and only 1 case was having above normal value.

Chloride

The normal value of chloride is 720-750 mg%. The range of chloride was found 670-750 mg% in all the cases (Table XIX).

TABLE XIX : Showing the chloride values in all cases.

Chloride (mg%)	No. of cases	Percentage
670 - 725	15	18.3
725 - 750	67	81.7
TOTAL	82	100.0

CYTOLOGICAL EXAMINATIONCells

Normal values of cells is 0-5 cells/cumm. Range of cells in all the cases was found 0-500/cumm. (Table XX).

TABLE XX : Showing the cells in cytological examination.

Cells/cumm.	No. of cases	Percentage
0 - 5 Lymphocyte	5	6.1
50 - 250 Polymorpha	2	2.4
Lymphocyte	55	67.3
250 - 500 Polymorpha	10	12.1
Lymphocyte	10	12.1
TOTAL	82	100.0

Cells were found within normal range (0-5) in 5 cases (6.1%) and range of 50-250 cell was found in 57 cases. Among them 55 cases had lymphocytes and 2 cases had polymorpha and in cells range 250-500, there were 20 cases in which 10 cases had polymorpha and lymphocytes each.

C.S.F. CULTURE

Culture examination was routinely performed and was sterile in 60 cases. Ten cases showed mycobacterium and 12 showed pyogenic bacterial growth.

TABLE XXI : Showing C.S.F. culture examination.

Culture	No. of cases	Percentage
Sterile	60	73.2
Tubercular bacilli	10	12.2
Pyogenic	12	14.6
TOTAL	82	100.0

E.E.G.

In EEG most common pattern was a generalised slow waves (delta/theta) with voltage calibration range(40-100 uv) and frequency range 2-7 cycle/second with intermittent high amplitude burst and spikes and waves complex were seen.

IV. SEQUELAE

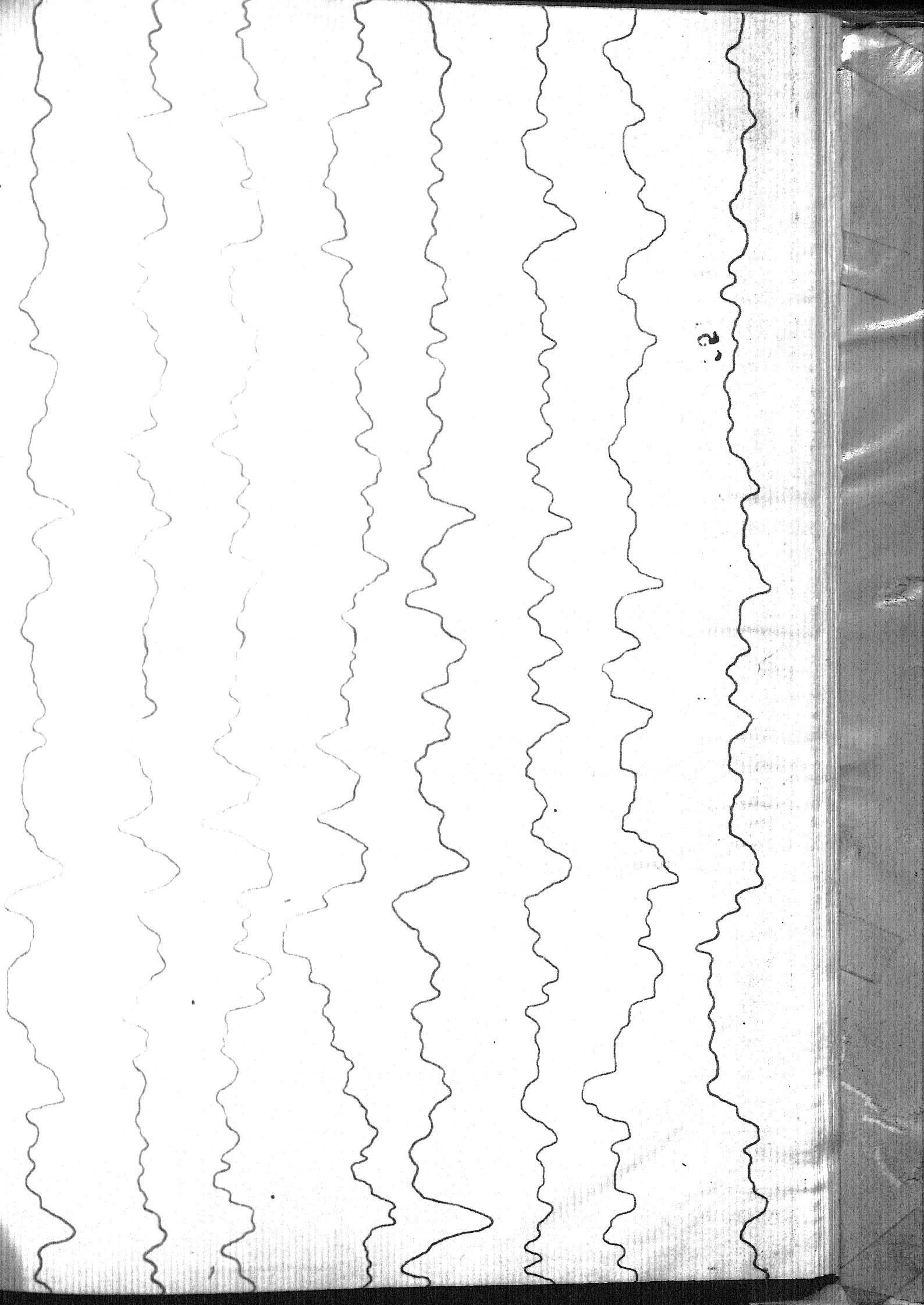
Sequelae of encephalitis was naturally present. Variety of sequelae were noticed which were the results of brain substances damaged by inflammatory process. They consist of impairment of memory and concentration, frontal headache, dizziness, incoordination, cerebellar ataxia and spastic gait.

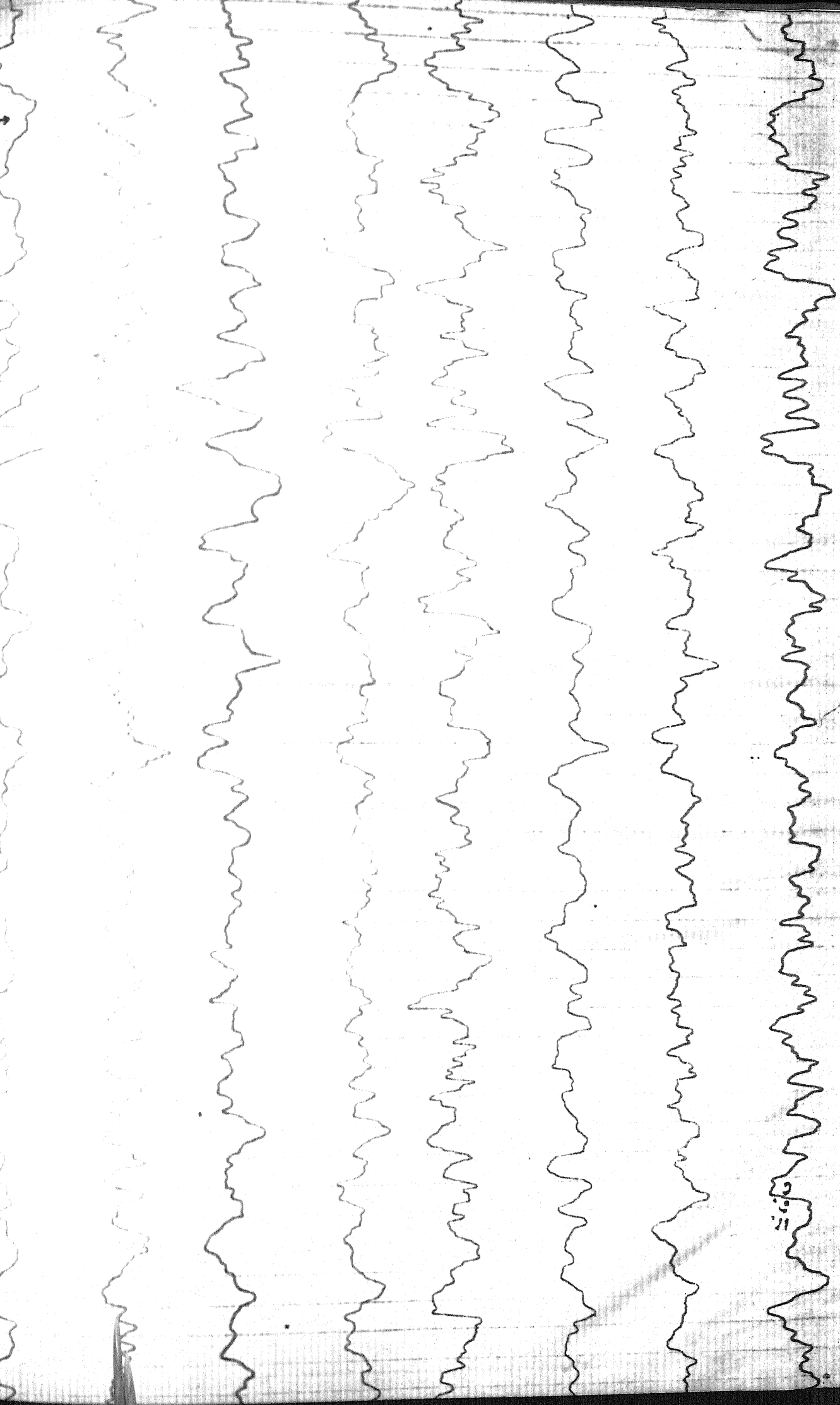
V. PROGNOSIS

Complete recovery was not a common observation in encephalitis as some residual effect of brain damage may persist. The table XXII shows the prognosis in these cases.

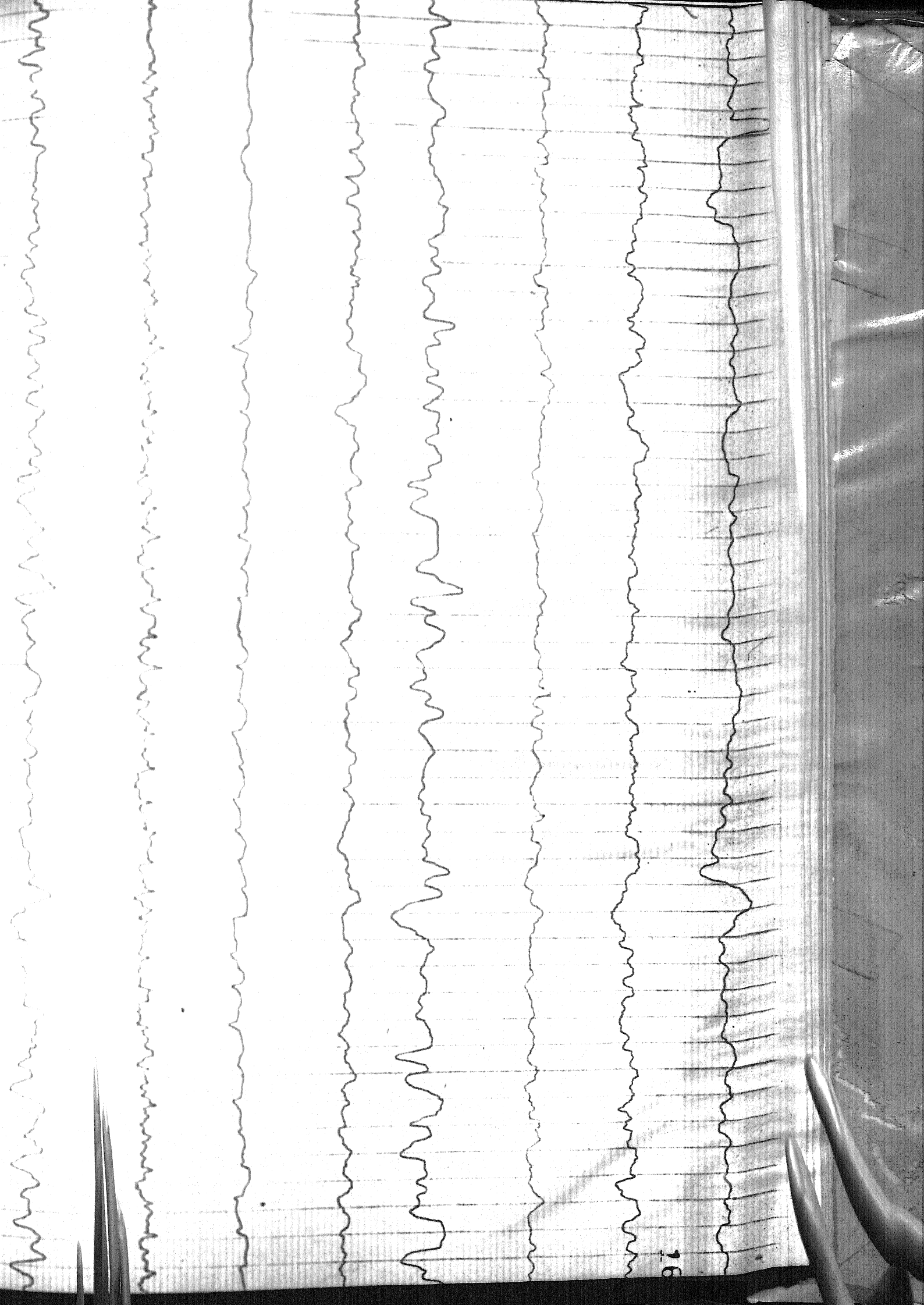
TABLE XXII : Showing prognosis of the cases.

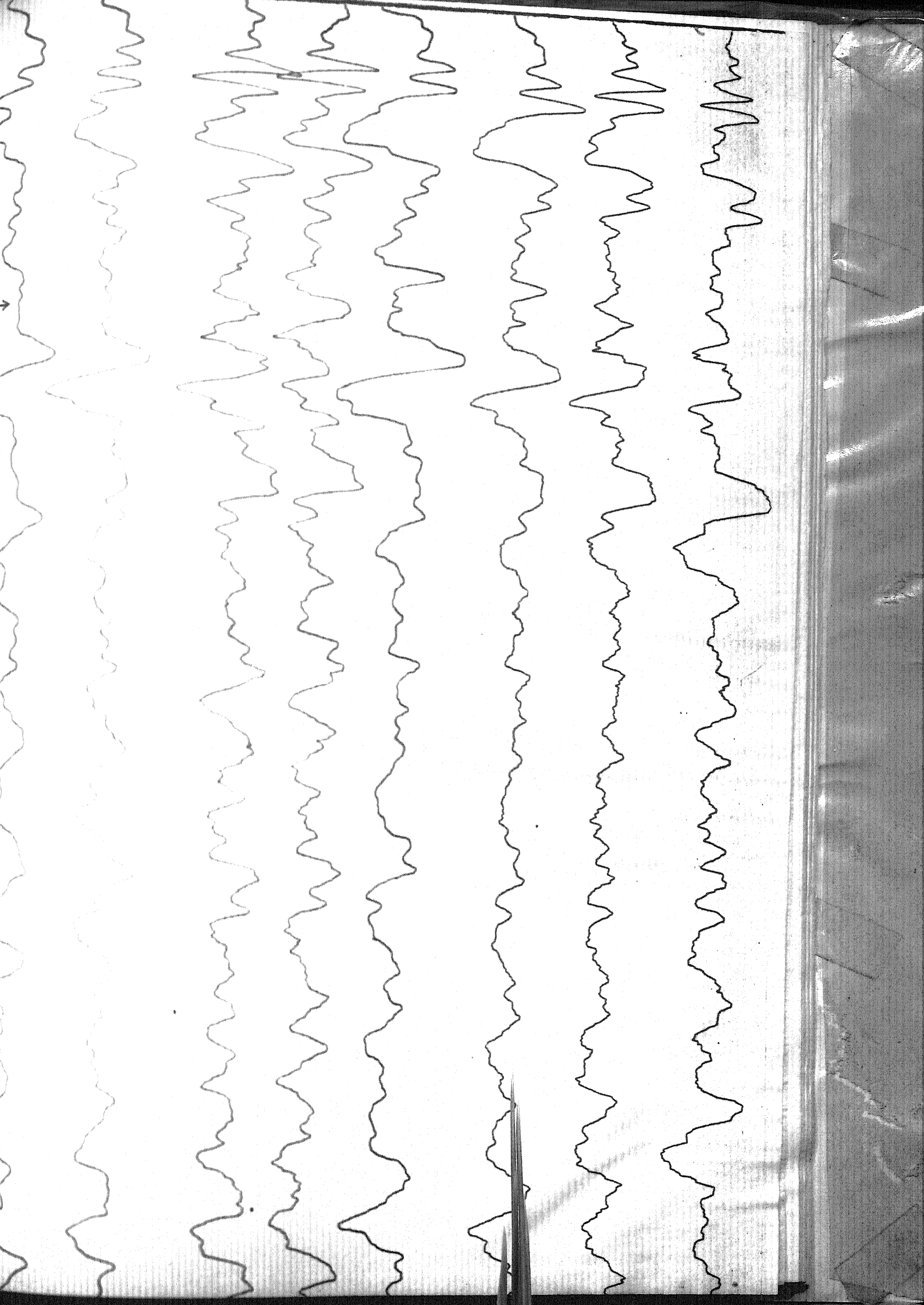
Prognosis	No. of cases	Percentage
Cured	19	31.67
Left with sequelae	18	30.00
Expired	22	36.67
Left against medical advice	1	1.66
TOTAL	60	100.00





12-lead





DISCUSSION

Epidemic occurrence of encephalitis is mainly confined to the paediatric age group (Bajpai, 1960; Gaur, 1956). The sporadic occurrences are not so biased to age.

In the present study, a striking case incidence of 36.67% in paediatric age group was observed whereas 63.33% cases occurred above 12 years of age. The peak age group in this study has been between 0-5 years (30.0%) and a next peak has been observed between 16-20 years of age (26.7%). Gaur (1956) and Bajpai (1960) found the peak between the same age groups but with a relatively higher figures of 43%, 33% respectively as they studied cases during epidemic. Gaur (1956) reported 2 cases out of 106 above 40 years but in the present study 15 cases were observed in this age group out of 60 cases showing that probably sporadic occurrence of illness is more frequent in higher ages than epidemics.

Viral encephalitis showed no sparing tendency to either of the sexes. The present study reveals the male and female ratio as 1.8 : 1. An almost similar findings were recorded by Gaur (1956) - 1.7:1, Bajpai (1960) - 1.6:1. Whereas Seal (1956) and Webb (1959) obtained little higher figures i.e. 2.3:1 and 2.2:1 respectively. This reveals an equal sex incidence in sporadic and epidemic illness.

It is well recognised that the onset of viral affection is acute but rarely a gradual onset is also

possible (Bennette, 1966) and observed by Gaur (1956) and Riggs (1961). In our study an acute onset in 97.2% cases was observed whereas in 2.8% cases were presented with insidious onset.

Usually the course of viral infections of CNS are stormy but of short duration (Dickerson, 1952; Gaur, 1956 and Bajpai, 1960). In the present study except in two cases the disappearance of clinical findings was observed and a duration of illness varied from 4-11 days. Prolonged pyrexia of 2 weeks was also observed in two cases. Chatterji (1948) also reported a prolonged pyrexia of 4 weeks in 8 cases.

Pyrexia was observed in 98.33% cases in the present study whereas Gaur (1956), Bajpai (1960) and Mathur (1959) observed pyrexia in 93.4%, 98.0% and 100% cases respectively. Observation of this study had been in near resemblance with Mathur (1959) and Bajpai (1960).

The range of temperature recorded varied from 98-104°F. Rarely the temperature may go up to 106°F (Gaur, 1956).

Generalised and focal convulsions were observed in 73.33% cases whereas Gaur (1956), Bajpai (1960) and Singh (1965) observed generalised and focal convulsion in 65% cases, 51.8% and 68.3% cases respectively. Our findings are similar with these workers. Low figures of convulsions were obtained by Gaur in epidemics.

Headache is a significant symptoms of raised intracranial tension. In the present study, headache was noted in 86.71% cases whereas lower incidence of 60.2% and 72% were reported by Riggs (1965) and Singh (1965) respectively.

Impairment of consciousness (Coma and semicoma) are quite common observation (Kundu, 1966; Bajpai, 1960 and Singh, 1965). Varied levels of consciousness was observed in 100% cases of present study whereas Kundu(1966) and Bajpai (1960) observed in 97% and 96% cases respectively. Our findings are closely resembling with Kundu (1966) and Bajpai (1960).

Signs of meningeal irritation was observed in 73.3% cases in the present study whereas Periera (1959), Bajpai (1960), and Gaur (1956) observed signs of meningeal irritation in 75%, 68% and 52.2% respectively. Our findings are similar with those workers. Low figures of signs of meningeal irritation were obtained by Gaur in epidemics.

Cranial nerve involvement although not common as in bacterial affection but significant involvement is mentioned (Webb, 1959; Mathur, 1959 and Singh, 1965). Dilated pupils may be due to raised intracranial tension besides nerve lesion.

In the present study dilated and sluggishly reacting pupils was observed in 48.33% cases and similar findings were described by Singh (1965) in 55.2% and by

Mathur (1959) in 38% cases. Facial palsy was found in 16.7% cases in the present study whereas Riggs (1961) and Periera (1961) reported it in 9% and 25% cases respectively.

An altered plantar response is frequent in encephalitis as shown by Singh (1965) in 57.9%, Bajpai (1960) in 49.8% cases. It was recorded in 66.67% cases in the present study.

Either localised or generalized exaggerated deep jerks were commonly observed whereas sluggish response was less frequently noted. Exaggerated deep jerks was noted in 70% cases whereas 69%, 62% and 58% were observed by Mathur (1959), Bajpai (1960) and Singh (1965) respectively. A sluggish response (Kundu, 1960 - 14%) was observed in 8.33% cases in the present study.

Bronchitis was a common accompaniment of encephalitis. An incidence of 16.4% and 20% was reported by Mathur (1959) and Singh (1965) respectively. It was recorded in 12% cases in the present study

LABORATORY INVESTIGATIONS

It is emphasized that it is not uncommon in C.N.S. affection of viral origin to have leucocytosis. Laraver (1961) found W.B.C. count of 4000-15000 cells/cumm in 46% cases. In the present study a WBC count range between 4000-16600 cells/cumm. with leucocytosis (Count above 11,000 cells/cumm.) in 23% cases. So it may be

emphasised that high count should not go in favour of bacterial origin.

C.S.F. Examination

It is well recognised that routine C.S.F. examination shows cell count of 50-500 lymphocytes or mononuclear cells/mm³ with normal sugar (40-80 mg%) and chloride (720-750 mg%) and slight rise in protein (40-120 mg%) levels besides sterile C.S.F. on culture (Seal, 1956; Dickerson, 1952; Mishra, 1981, Rubach, 1962) and Hearver, 1962 etc.).

The following table shows some significant observations obtained by the different workers in C.S.F.

Workers	Cells/ cumm.	Protein (mg%)	Sugar (mg%)
Seal (1956)	50 - 150	40 - 100	30 - 60
Dickerson (1952)	50 - 400	35 - 90	40 - 75
Mishra (1981)	33 - 231	40 - 140	40 - 100
Hearver (1962)	Upto 500	22 - 96	40 - 80
Present study (1992)	50 - 500	40 - 120	40 - 80

This is obvious from the above table that marked leucocytosis should not dilute viral etiology. Low chloride levels were also found in 18.3% cases of present study as was seen by Gaur (1962) and Singh (1965).

In the acute stage of viral encephalitis the EEG abnormalities consist of generalised slowing in the range of delta/theta activity. Generalised slowing with

predominantly focal abnormality.paroxysmal.

E.E.G. abnormality	Misra & Car (1981)	Present study (1992)
Generalised slowing of delta/theta activity	37.5%	50.0%
Generalised slowing with predominantly focal abnormality	25.0%	20.0%

SEQUELAE AND PROGNOSIS

In the present study number of sequelae of encephalitis were observed. They constituted impaired consciousness and memory, frontal headache, fine tremors of limbs and inco-ordination. Some of these and other sequelae were observed by other workers also (Bajpai, 1960; Riggs, 1961). It was observed in 30% cases in the present study. In the present study mortality rate was 36.67% cases. A mortality rate of 82% and 28% was also observed by Kundu (1956) and Mathur (1959) respectively.

S U M M A R Y C O N C L U S I O N

The present work was carried out with the aim to study the incidence of viral encephalitis, its clinical profile, prognosis, mortality and morbidity in Bundelkhand region. For this purpose ninety patients who were admitted with features suggestive of intracranial infection viz. fever, headache and altered sensorium in medical and paediatric wards of M.L.B. Medical College, Hospital Jhansi, were included.

All the cases were subjected to detailed assessment encompassing a thorough history, clinical examinations and laboratory investigation. On the basis of C.S.F. examination, out of total 90 cases, 10(11.11%) cases were found to be suffering from tubercular meningitis and 12 cases were suffering from septic meningitis and on the basis of highly positive widal test 8 cases were thought to be suffering from enteric encephalopathy. After excluding these 30 cases of T.B.M. septic meningitis and enteric encephalopathy the remaining 60 cases were considered to be patients of viral encephalitis.

The observation mainly related to study clinical profile of viral encephalitis. The findings of study can be summarised as follows :-

1. There were 36.67% cases of paediatric age group (2-12 years) whereas 63.33% cases were in the age group of 13-70 years.
2. The highest number of patients were in the age group of 0-5 years (30%) followed by 26.7% cases in the age group of 16-20 years.
3. There were 63.3% male and 36.7% female cases in the present study.
4. There were 93.3% cases from low socio-economic status living in unhygienic conditions.
5. A variety of symptoms were observed in all the cases. They included mainly fever (98.33%), headache (86.71%), convulsions (73.33%) and altered sensorium (100%) cases.
6. The maximum (97.2%) cases were having characteristically acute onset of illness and remaining 2.8% cases were having insidious onset.
7. In majority of cases, temperature subsided in 3-9 days but in 2 cases it was lasted for two weeks.
8. Patients with unconsciousness took 7 days to 3 weeks times for its clearance. Deeper the impairment of consciousness longer was the period of recovery.
9. Headache and vomiting usually subsided in 3-9 days in majority of the cases.
10. Convulsions were controlled in majority of cases with proper sedation within 2-3 days and the tremor persisted till discharge in 8 cases.

11. Dilated and sluggishly reacting pupils were observed in 48.33% cases and facial palsy was found in 16.7% cases.
 12. Extensor plantar response was found in 66.67% cases and deep tendon reflexes was exaggerated in 70% cases. Sluggish response was observed in 8.33% cases.
 13. In the present study CSF examination showed cell count - 50-500 lymphocytes or mononuclear cells/mm³ with normal sugar (40-80 mg%) and chloride (720-750 mg%) and slight rise in protein (40-120 mg%) levels besides sterile CSF on culture.
 14. EEG abnormality in the present study showed generalised slowing of delta/theta activity in 50% cases. Generalised slowing with predominantly focal abnormality in 20% cases.
 15. Number of sequelae presenting encephalitis pattern viz. impaired consciousness and memory frontal, fine tremors and incoordination and spastic gait were observed in the present study.
 16. In the present study mortality rate was 36.67% (22 cases), left with sequelae - 30% (18 cases), 31.67% (19) cases were cured and 1.66%(1) case left the hospital against medical advice.
-

B I B L I O G R A P H Y

1. Agarwal, S.C.; Sehgal, S.; Bardoloi, J.N.S. and Mahajan, R.C. : Antibody in CSF to certain non enteroviral agents in viral infection of central nervous system. Ind. J. Med. Res., 1971; 59 : 190.
2. Aguilar, M.J.; Calachini, P.R. and Finley, K.H. : Perinatal arbovirus encephalitis and its sequelae. In infections of the nervous system (ed. H.M. Zimmerman) Vol. 1, Chapter 13, Baltimore.
3. Ahuja, M.L. and Brooks, A.G. : Human rabies encephalitis. Arch. Neurol (Chicago) 1950; 20 : 599.
4. Armstrong, C. : The experimental transmission of poliomyelitis to the eastern cotton rats. *Sigmodon hispidus* Pub. Health. Res. 1936; 54 : 1719.
5. Bajpai, P.C. et al : Acute epidemic encephalitis in children. J.A.M.A., 1960; 35 : 1.
6. Baker, A.B. : Western variety of equine encephalitis in man. Arch. Neurol, Psychiat, 1942; 47 : 565.
7. Bell, F.J. : Abortive rabies infection. J. Inf. Dis. 1964; 114 : 249.
8. Broor, S.; Pal, S.R.; Banerjee, A.K.; Chitkara, N.L.; Chaudhury, S.; Chopra, J.S. and Sawhney, B.B. : Virological and pathological study of subacute sclerosing panencephalitis. Ind.J.Med.Res. 1975; 63 : 671.

9. Chatterji et al. : Clinical study of 89 cases of encephalitis from Calcutta (1942-45).
Ind. Med. Gazette, 1948; 80 : 285.
10. David, W.A. : A study of birds as hosts for the virus of eastern equine encephalomyelitis.
A.M.J. Hyg., 1940; 32 : 45.
11. Dickerson et al : Diagnosis and immediate prognosis of encephalitis. Am. J. Med. 1952; 12 : 277.
12. Donald, H. Harter : Principal of internal Medicine, 12th ed. 1991.
13. Dupton, J.R. and Earle, K.M. : Human rabies encephalitis. Neurology(Minneap) 1965; 15 : 1023.
14. Finley, K.H. : In viral encephalitis (ed. W.S. Fields and R.J., Blattner). Thomas, Springfield, Illinois, 1958.
15. Fuders, J.F.; Weller, T.H. and Robbins, F.C. : Cultivation of the Lansing strain of poliomyelitis virus in cultures of various human embryonic tissues. Science 1949; 109 : 85.
16. Geur, K.N. : Viral encephalitis. Clinical study of 106 cases in 1954 epidemic in Agra. J.I.M.A. 1956; 26 : 384.
17. Goldwasser, R.A. and Kissling, R. : FA staining of street and fixed rabies virus. Proc. Soc. Exp. Bio. Med. 1958; 98 : 219.

18. Gupta, P.C.; Seth, P.; Banerji, A.K.; Gupta, R.K. and Roy, S. : Herpes simplex encephalitis. *Neurol (India)*, 1972; 20 : 156.
19. Gupta, P.C.; Seth, P.; Banerji, A.K.; Gupta, P.K. and Roy, S. : Herpes simplex encephalitis. *Neurol* 1972; 20 : 136.
20. Gupta, P.C.; Roy, S. and Baleja, S. : Viral encephalitis : A clinical EEG virological and pathological study in 32 cases. *Ind. J. Med. Res.*, 1975; 63 : 101.
21. Hannoun, C.; Shirak, H. and Osetowska, E. : Encephalitides due to arboviruses. In *Clinical Virology* (ed. F. Dabre and T. Celers). Saunders, Philadelphia, 1970.
22. Hattwick, M.A.W. and Gregg, M.B. : The disease in man. In the natural history of rabies. ed. Baer G.M. Vol II Academic Press Ind, New York, 1975.
23. ICMR : Research in Rabies. *ICMR Bulletin*, 1973, No. 3.
24. ICMR : Japanese encephalitis (JE) in India. *I.C.M.R. Bull*, 1975; 5(3), 1.
25. ICMR : I.C.M.R. Report 1973; p. 126.
26. Johnson, H.N. : The diagnosis of rabies. In *diagnostic procedures for viral and rickettsial disease*, ed. Lennette, E.H. and Schmidt N.J., 3rd edn. Amer. Pub. Health. Ass., 1964.
27. Johnson, R.T. : *Viral infections of the nervous system*. Raven. Press, New York, 1982.

28. Kundu, S.C. : Viral encephalitis : study on 50 cases in Jamalpur (Bihar). J.A.P.I.; 14 : 341; 1966.
29. Landsteiner, K. and Pepper, E. : Übertragung der poliomyelitis and acute aug. Affen. Z. Immunitätsforsch orig, 1909; 2 : 377.
30. Lennetts, E.H. and Emmons, R.W. : The laboratory diagnosis of rabies. In rabies, ed. Nagano, Y., and Davenport P., Univ. Park Press, Baltimore, 1971; p. 77.
31. Lowenberg, K. and Zbinden, T. : Epidemic encephalitis (St. Louis type) in Toledo, Ohio, Arch. Neurol Psychiat. Chicago, 1936; 36 : 1155.
32. Mathur, et al. : The 1958 epidemic of virus encephalitis in Agra. J.I.M.A., 1959; 32 : 45.
33. McCallum. Acute virology, 1959; 3 : Suppl. 17.
34. Mclean, R.G. : Rabies in Raccoons in SE United States. J. Inf. Dis., 1972; 125 : 674.
35. Meyer, H.M. et al. : C.N.S. syndromes of viral etiology. Am. J. Med., 1960; 29 : 334.
36. Meyer, K.F. : A summary of recent studies of an equine encephalomyelitis. Ann. Int. Med., 1932; 6 : 664.
37. Misra, U.K.; Nag, D.; Kar, A.M. : Some observations of Japanese encephalitis in Uttar Pradesh. J.A.P.I., 1981; 29 : 293.

38. Parker, R.L. and Sikes, R.K. : Development of rabies inhibiting substances in skunks infected with rabies virus. Pub.Health Rep., 1966;91:241.
39. Reyes, M.G.; Gardner, J.J.; Poland, J.D. and Monath, T.P. : St. Louis encephalitis. Quantitative histologic and immunofluorescent studies. Arch. Neurol. Chicago, 1981; 38 : 329.
40. Riggs et al : Houston epidemic of encephalitis in 1964. J.A.M.A. July, 1965; 26 : 193.
41. Rhodes, A.J. and Rooyen, C.E. : Text book of virology. 4th ed., 1962.
42. Robertson, E.G. : Murray valley encephalitis : Pathological aspects. Med. J. Aust., 1952;1:107.
43. Sayeed, Z.A.; Kalyanaraman, S. and Arjundas, G. : Proc. Inst. Neurol. Madras, 1975; 1 : 3.
44. Seal et al. : Epidemiological aspects of the 1954 epidemic of encephalitis in Jamshedpur. J.A.M.A., 1956; 26 : 371.
45. Sengupta, S.N.; Sen, M. Das, P.K. and Bhattacharya, D.P. : Epidemic of Japanese encephalitis in West Bengal. J.A.P.I., 1974; 22 : 463.
46. Singh, D. : Observation of encephalitis at Bhopal. J.I.M.A., 1965; Nov. 1; 9 : 45.
47. Shope, R.E.; Murphy, F.A.; Harrison, A.K.; Causey, G.E.; Simpson, D.I.H. and Moore, D.L. : J. Virol., 1970; 6 : 690.

48. Singhal, B.S.; Wadia, N.H.; Vibhakar, B.B. and Dastur, D.K. : Subacute sclerosing pan-encephalitis. I. Clinical aspects. *Neurol. Ind.* 1974; 22 : 87.
49. Thomas, J.B.; Sikes, R. and Ricker, A. : Evaluation of indirect fluorescent antibody technique for detection of rabies antibody in human sera. *J. Immunol.* 1963; 91 : 721.
50. Van Bogaert, L. : Une Leuco-encephalite sclerosante subaigue. *J. Neurol. Neurosurg. Psychiat.* 1945; 8 : 101.
51. Veeraregghavan, N. : Coonoor scientific reports. *Pasteur. Inst. S. India*, 1955.
52. Veeraregghavan, N.; Gajanan, A.; Rangaswami R.; Connunni, P.T.; Saraswathi. *Coonoor. Scientific Pasteur. Inst S. India*, 1969.
53. Wadia, R.S. : Neurological involvement in Kyasanur Forest disease. *Neurol. India*, 1975; 23 : 115.
54. Webb, H.E. and Lakshman, Rao, R. : Kyasanur Forest disease. A general clinical study in which some cases with neurological complications were observed. *Trans. Roy. Soc. Trop. Med. Hyg.*, 1961; 55 : 284.
55. Webb and Periera. Encephalitis cases from Vellore (Madras). *J.I.M.A.*, 1959; 33 : 16.

56. Webb, H.E.; Cannolly, J.H.; Kane, F.F.; O'Reilly, K.J. and Simpson, D.I.H. : Laboratory infections with houping ill with associated encephalitis. *Lancet*, 1968; 11 : 255.
 57. Webb, J.K.G., Pavri, K.; George, S.; Chandy, J. and Jadhav, M. : Isolation of virus from human brain : In Asian Paediatrics. *Sci. Proc. 1st All Asian Cong. Paed.* New Delhi, 1961, ed. Bose, S.K. and Dey, A.K., Asia Pub. House, Bombay, 1964; p. 1992.
 58. Webster, L.T. and Fite, G.L. : Experimental studies on encephalitis. *J. Exp. Med.*, 1935; 61 : 103.
 59. WHO : Expert Committee on rabies report. WHO. Tech. Rep. Series. No. 523; 1973.
 60. Winkler, W.C. : Rabies in the United States. *J. Inf. Dis.*, 1974; 125 : 674.
-